

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
14 October 2004 (14.10.2004)

PCT

(10) International Publication Number  
**WO 2004/088192 A2**

(51) International Patent Classification<sup>7</sup>: **F16L 11/12**

(21) International Application Number:  
PCT/GB2004/001424

(22) International Filing Date: 2 April 2004 (02.04.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
0307808.6 4 April 2003 (04.04.2003) GB

(71) Applicant (for all designated States except US): **EATON LIMITED** [GB/GB]; P.O. Box 22, Norfolk Street, Worsley Road North, Worsley, Manchester M28 3ET (GB).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **HARTLE, Kevin, John** [GB/GB]; 59, Belbroughton Road, Halesowen, West Midlands, B63 4LS (GB).

(74) Agents: **HAMMERSLEY, John et al.**; Harrison Goddard Foote, Orlando House, 11c Compstall Road, Marple Bridge, Stockport SK6 5HH (GB).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

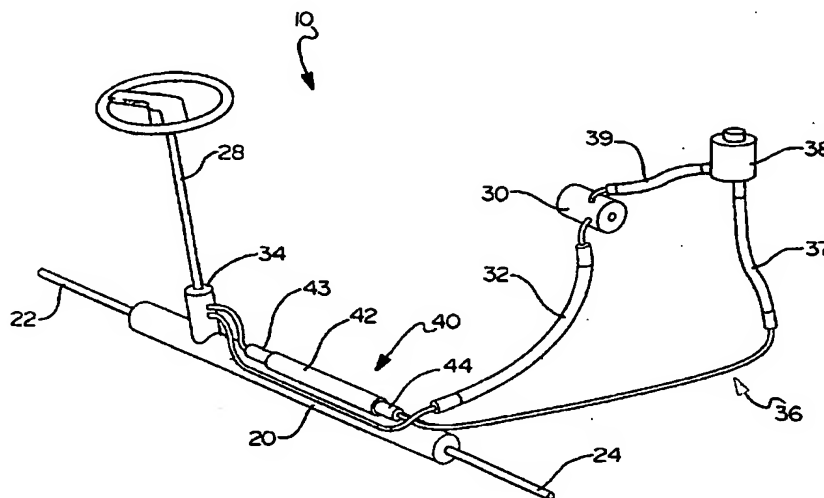
(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Declarations under Rule 4.17:**

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ,

[Continued on next page]

(54) Title: **FLUID DISTURBANCE DAMPING IN FLUID DRIVEN ACTIVATION DEVICES.**



(57) Abstract: Pressure disturbances in the driving fluid of an actuation device (10), such as a vehicle power assisted steering system, that give rise to noises or vibration discernible to vehicle users are damped by including in the hydraulic circuit a damping hose (42) having a peripheral wall that defines a fluid containing space of non-circular cross section, permitting such disturbances to deform the wall shape locally to vary the cross sectional area without relying upon stretching of the wall. Suitable hose form are those defining a cross section which is elliptical or with opposite wall parts tending to close together without fluid pressure, and preferably is disposed in the lower pressure return line (36) between fluid driven actuator (26) and pump (30), adjacent the actuator when that is a source of noise or vibration to be damped.